

BOTANY.—*Identification of the commonly cultivated species of Cucurbita by means of seed characters.* PAUL RUSSELL, Bureau of Plant Industry. (Communicated by WILSON POPENOE.)

The genus *Cucurbita*¹ consists of ten species, all of which are possibly native to the New World, although authorities differ on this point. Seven of these species are perennial, and not cultivated in the United States, while the other three are annual. These are: *C. maxima* Duchesne, of which the Hubbard squash, the Delicious squash, and the Boston Marrow squash are examples; *C. pepo* L., of which the Large Yellow pumpkin, the Pie pumpkin, and the Summer Crookneck squash are examples; and *C. moschata* Duchesne, of which the Sweet Cheese (or Kentucky Field) pumpkin, the Japanese Pie pumpkin, and the Golden Cushaw pumpkin are examples. Besides these, many more varieties are cultivated in the United States. Among these the great diversity of size, shape, color, and character of flesh has made it difficult to determine to which species a given variety may belong.

In order to clear up this confusion, an attempt has been made to devise a key whereby the specific identity of any variety may be determined by means of the external characters of the seeds.

Some writers have included general notes on the seeds in the descriptions of these species, and one of them, C. D. Harz, gives² rather full descriptions of the seeds. None of them, however, has given sufficient data to permit a ready differentiation by means of seeds alone. The only mention of a seed scar is by Harz, who states (p. 813) that the seed of *C. pepo* has an oblique scar. Our experiments have shown that this is not the case, for the scar in this species is normally squarely truncate or rounded. (See Fig. 1.)

The work has been much simplified because of the fact, shown by Charles Naudin,³ L. H. Bailey,⁴ and J. P. Lotsy,⁵ that these three species do not hybridize, although the varieties, within the species, often cross freely.

The field tests were carried on at the Arlington Experimental Farm, near Washington, D. C., in coöperation with the Department

¹ According to some authorities the use of the name "*Cucurbita*" should be confined to the species now generally known as *Lagenaria vulgaris* Ser., but since the purpose of this paper does not include a revision of the genus *Cucurbita*, the current usage is followed.

² Harz, C. D. *Landwirtschaftliche Samenkunde*. Berlin. 1885.

³ *Ann. Sci. Nat. Paris. Sec. Bot.* 6: 59. 1856.

⁴ *Third Ann. Rept. Cornell, N. Y., Exp. Sta.* 1890: 180-187.

⁵ *Genetica* 1: 1-21. 1919.

of Agriculture. The following varieties were grown in 1922 and 1923. The species under which each is listed was determined by botanical characters other than those of the seeds, and the seeds of each group were subsequently studied for specific characters.

Cucurbita maxima: Arikara squash, Banana squash, Boer pumpkin, Boston Marrow squash, Delicious squash, Hubbard squash, Ironbark pumpkin, and Kitchenette Hubbard squash.

Cucurbita pepo: Cocozelle squash, Early Mandan squash, Large Yellow pumpkin, Mammoth Tours pumpkin, Pie pumpkin, and Summer Crook-neck squash.

Cucurbita moschata: Charles Naudin squash, Chirimen squash, Courge bedouine, Faan Kwa squash, Golden Cushaw pumpkin, Japanese Pie pumpkin, Macleay River pumpkin, and Sweet Cheese (or Kentucky Field) pumpkin.

KEY TO THE ANNUAL SPECIES OF CUCURBITA

Fruiting peduncle finely ridged, not ribbed; leaves entire or but faintly lobed.....*C. maxima*.

Fruiting peduncle strongly ribbed; leaves distinctly lobed.

Apex of fruiting peduncle not enlarged, or but slightly so; calyx lobes narrow.....*C. pepo*.

Apex of fruiting peduncle much enlarged; calyx lobes usually broad, sometimes leaflike.....*C. moschata*.

Cucurbita maxima was originally described⁶ by Duchesne as follows:

Melopepo fructu maximo albo. Tournef. 106.

Cucurbita aspera, folio non fisso, fructu maximo albo sessili. J. B. 2. p. 221.

Pepo maximus indicus compressus. Lob. Ic. 641.

Pepo compressus major. Bauh. Pin. 311.

Cucurbita pepo. a. Linn. ?

The body of the description, which is in French, may be translated as follows:

The large-fruited pumpkin or gourd, *Cucurbita maxima* Duch.—This is very different from the other gourds; it is distinguished by the flowers being more widened or enlarged at the base of the calyx, with a reflexed limb, and by the large, rounded-heart-shaped leaves, borne on their petioles in an almost horizontal position. They are softer and their hairs less stiff than in the other gourds, somewhat resembling the leaves of melons. All parts of the plant are stouter and larger than those of the other gourds; the fruit, generally larger and more constant in its flattened-spherical form, has regular ribs and a considerable depression at each end; the pulp is firmer and at the same time juicy and melting; the skin is fine, like that of the Pâtissons. These are the chief characters of this species.

⁶ Lamarek Encycl. 2: 151. 1786.

In amplifying the above, it may be said that the leaves of *C. maxima* are more or less kidney-shaped, faintly 5-lobed or altogether entire, never deeply lobed as in the other two species. The fruiting peduncle is cylindrical and finely ridged, never ribbed. The sepals are usually filiform, and the corolla lobes reflexed.

The original description⁷ of *C. pepo* L., with its synonymy, is as follows:

Cucurbita foliis lobatis, pomis laevibus.

Cucurbita seminum margine tumido. Hort. Cliff. 452. Hort. Upsal. 291. Roy. lugdh. 263.

Cucurbita major rotunda, flore luteo, folio asperso. Bauh. pin. 213.

Cucurbita indica rotunda. Dalech. Hist. 616.

A free translation of the above, including the synonyms on which the species is based, would be "a cucurbit with lobed, rough leaves, yellow flowers, large, round, smooth fruits, and seeds with swollen margins." The species may be further characterized as follows:

The leaves are decidedly lobed and often deeply cut, the number of lobes being 3, 5, or 7. In many of the varieties the hairs on the petioles and lower surfaces of the leaves become very stiff and sharp. The calyx lobes are rather fleshy and subulate, never foliaceous. The corolla is very similar to that of *C. maxima*, except that it is rather less spreading. The fruiting peduncle is 5-ribbed, and never more than slightly enlarged at its point of attachment to the fruit.

Duchesne's original description⁸ of *C. moschata* may be summarized as follows:

This species, very difficult to circumscribe, is made up of several varieties which have been too little observed to determine well. The plant is first mentioned by Chanyalon in his *Voyage de la Martinique*. Lamarek does not find sufficient differences to separate it as a distinct species. However, two differences may be noted, the contraction of the base of the calyx, and the close smooth down of the leaves. It resembles the calabash (*Lagenaria vulgaris*) in the whiteness of the flowers, the elongation of the green tips of the calyx, and the musky flavor of the fruit. The leaves resemble those of the gourds; they are angular or sharp lobed. The fruit is most often flattened; sometimes it is cylindrical, club-shaped or pestle-shaped; the color of the pulp varies from sulfur yellow to orange red. The fruit is cultivated like the calabash. In spite of its common name "musk melon," it furnishes only a mediocre fruit, rarely eaten raw; however, it is somewhat esteemed in the southern parts of France, in Italy, and in the islands of America. The fineness of its flesh and its good flavor make it preferred to most pumpkins.

The above description may be amplified by stating that the leaves are generally dark green and mottled with white at the angles of the principal venations. The calyx tube is much reduced, sometimes almost want-

⁷ Sp. Pl. 1010. 1753.

⁸ Dict. Sci. Nat. 11: 234. 1818.

ing, and the sepals, instead of being subulate or filiform, are broader and very often leaflike. The fruiting peduncle is 5-angled and considerably swollen where it is attached to the fruit; it is less sharply angled than the peduncle of *C. pepo*.



Fig. 1 Seeds of the commonly cultivated species of *Cucurbita*

Top row, Pie pumpkin (variety of *C. pepo*); middle row, two varieties of *C. maxima*; bottom row, two varieties of *C. moschata*.

As a result of the discovery of apparently constant specific characters in the seeds of the cultivated species of *Cucurbita*, it has been possible to name correctly over a hundred seed samples in the seed collection of the Office of Foreign Seed and Plant Introduction, Bureau of Plant Industry. The following key should also prove valuable as a check on the identity and, to some extent at least, on the purity of commercial seed samples of varieties included in these three species.

KEY TO THE SEEDS OF THE ANNUAL SPECIES OF CUCURBITA

Sear obliquely truncate; face of seed pure white or clear brown .. *C. maxima*.
 Sear normally squarely truncate or rounded; face of seed ashy gray or
 dirty white

Margin agreeing in color with face of seed, usually smooth and not
 swollen..... *C. pepo*.

Margin darker than face of seed, rarely smooth, often swollen and corky,
 or roughened and stringy..... *C. moschata*.

The characters upon which this key is based are shown in the accompanying illustration (Fig. 1). The top row of seeds are of the Pie pumpkin, a good example of *C. pepo*. The middle row shows two varieties of *C. maxima*; the one at the left is the Ironbark pumpkin, from South Africa; the one at the right is the well-known Hubbard squash. Both of these show the oblique sear characteristic to *C. maxima*. The bottom row shows two varieties of *C. moschata*; the one at the left is the Faan Kwa squash, from China; the one at the right is Charles Naudin, from France.

In some cases it has been observed that immature seeds do not show the distinguishing characters, so that, for identification purposes, it is advisable to have mature seeds, and also to have several of a kind, in order to allow for unusual variations.

BOTANY.—*The genus Forchammeria*.¹ PAUL C. STANDLEY, U. S. National Museum.

In the course of work upon the Trees and Shrubs of Mexico, now in course of publication as volume 23 of the Contributions from the National Herbarium, the writer happened upon material of two Mexican plants belonging to distinct species but evidently congeneric, which it was impossible to refer even to a family, since they bore little general resemblance, apparently, to anything reported from Mexico. Recently, however, while examining a collection of plants obtained by O. F. Cook in Petén, Guatemala, there was discovered a fruiting specimen of a plant which was undoubtedly a relative of the Mexican ones, and their systematic position was recognized.

The Guatemalan plant was *Forchammeria trifoliata*, a species described from Yucatán, and based upon flowering material alone. The fruit had not been known previously, and proved to be so dissimilar from that of two common Mexican species of the genus that the close relationship existing between these three plants would not be apparent if their fruits were placed side by side. Study of the copious material of *Forchammeria* in the National Herbarium indicates that the species fall into two sharply marked groups, which may be

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